RESEARCH HIGHLIGHT
Basic Energy Sciences Program
Geosciences Subprogram

Project: Organic Anion - Mineral Surfaces

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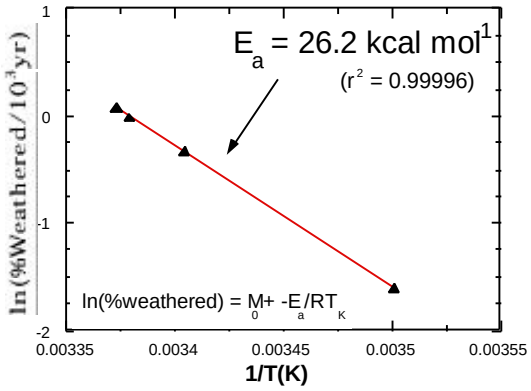
Objective: Results from this project are used to establish the global role of adsorbed organic anions in the dissolution and growth of silicates during diagenesis and soil processes.

Results: The effect of temperature on silicate weathering has been highlighted as one of the more important controls on long-term climate stability. Historically, weathering rates have been calculated from solute-budgets of streams integrating short-term (100-1000 year) weathering response on a basinal scale. To model weathering over longer, geologic time scales requires a sensor with a longer time constant. The most obvious alternative to water-based weathering analyses is to quantify weathering dependencies by looking directly at the rocks themselves. We propose a method for quantifying weathering dependencies in the field using back-scattered electron BSE digital imaging, and calibrate the method against solute-budget, and experimental data using plagioclase weathering rates from ^{14}C-dated basalt flows on Hualalai Volcano in Hawaii.
After correcting for microclimatic effects, temperature-dependent plagioclase weathering indicate a field activation energy of 26 kcal mol^{-1}, appreciably larger than the values derived from solute-budget and laboratory measurements of feldspar weathering. These results will be published in June, 1995 in Geochimica et Cosmochimica Acta; this work is the result of a collaboration with Ronald I. Dorn at Arizona State University in Tempe.



Significance: These results establish a baseline for the T-dependency of organic-free weathering of minerals near the Earth's surface and a starting point from which to consider the coupled geochemical and hydrologic factors controlling global cation and carbon fluxes from weathering.